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EDITORIAL

Efficient Storage of Agricultural Produce. That most of the agricultural produce when stored under indifferent conditions are damaged by rodents, insects and fungi resulting in considerable loss is a fact too well-known even to the uneducated farmer, while the deterioration in their quality or loss of nutritive value is not well realized. The damage due to insect attack is particularly severe and attains colossal magnitude in certain years especially in the case of naked cereal grains, oilseeds and pulses which are improperly dried and stored for long periods. The ordinary tiller of the land in this country takes sufficient precautions and eliminates this waste perhaps only in the case of the produce stored for seed purposes. He is generally accustomed to sell away the bulk of his produce in a semi-dried form soon after the harvest, as he sadly lacks the facility for storing them free from the depredations of vermin. The storage of agricultural produce has become a very acute and important problem in these times of war when normal trade and movement of produce have been appreciably affected and stocks for local consumption have to be conserved for fairly long periods.

Realising the utmost necessity for conserving all food stuff, and the saving that would accrue to the nation from a correct understanding of the various problems of storage, the Department of Scientific and Industrial Research in England initiated an intensive survey under the direction of Prof J. W. Munro of the Imperial College of Science, soon after the outbreak of hostilities in Europe. Though the survey brought out the fact that regulation of humidity and temperature of warehouses are the major factors that would control insect infestation, it was emphasised that "palliative measures such as good ventilation, general cleanliness, segregation of infested consignment and other simple methods of control would yield results of considerable value". This finding is of particular application to this country as regulation of humidity and temperature is likely to prove too costly for adoption on any scale.

The problem of storage also attracted the attention of the Board of Scientific and Industrial Research in India in 1940, when they were confronted with the question of storing large surplus of oilseeds due to the

closure of continental markets and the slump created by the war. The matter has also been taken up by the Imperial Council of Agricultural Research which has on hand research schemes for a co-ordinated study of the storage pests of sorghum, wheat, rice, oilseeds and pulses, in which, some of constituent Provinces and States in India are co-operating The research programme envisages among other things a survey and study of the pests with special reference to ecology, the use of inexpensive preservatives such as can be easily obtained by the villagers and a critical study of the indigenous systems of storage and their relative efficiency The last item is of special interest as there exists in particular localities of our country certain specific methods of storage which are declared to be almost cent per cent free from insect infestation, and which may with advantage be copied elsewhere. We are reminded of the under-ground granaries of Coimbatore district and other dry tracts and the spacious wooden seed stores of the West Coast which have been known to preserve grains for over two years. It is hoped that these investigations when completed will bring out useful information on various aspects of storage and the best method of reducing damage to stored produce.

As indicated already, damage and deterioration of stored produce in India can be mostly ascribed to improper drying of the commodity and absence of adequate granary or warehouse facility in the producing or assembling centres. To remedy this defect at least in the case of one commodity like groundnut, the Madras Government have on hand the construction of warehouses costing Rs. 4,51,000 in 15 important centres of groundnut production in this Presidency, during the current year. These godowns according to the press report "are premarily intended to serve the needs of the small growers who have neither the accommodation in their houses nor are able to rent suitable houses. At places where there are suitable co-operative societies, these godowns will be run by those societies and in other places they will be run by the Agricultural Department". It is presumed that these godowns will have attached to them proper drying floors for periodical sun-drying of the produce and small fumigation chambers wherein badly infested produce or packing gunnies or other containers could be fumigated for extermination of the pest. We hope that this generous action of the Government will be appreciated by the *ryots* and full advantage taken of the facilities now afforded. We also appeal to the village *panchayats*, co-operative societies and trade organisations to copy this example and bring into existence more warehouses so that we may have ere long a large number of suitable public godowns for the proper storage of agricultural produce with which is linked the wealth and prosperity of our country.

Some Factors Governing Fruit-bud Formation in Mangoes (*Mangifera indica* Linn.)

II Relation Between Growth and Flowering.

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and

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Introduction. A correct understanding of the relationship between various growth features and productivity was shown in the previous paper* as essential in successful mango production. Productivity is the ultimate manifestation of the tree performance, from the grower's point of view. But a comparison of this ultimate phase with the growth features does not appear to be valid for the purpose of determining the most useful features of growth for ensuring high production and regular bearing in mangoes. The correct basis of study in a problem of this nature would be flowers and not fruits. Flower is undoubtedly a preliminary to fruit, but it does not follow from this that a heavy crop of flowers is always followed by a heavy crop of fruits. It is the universal experience of mango growers that, in several years flowers shed either due to environmental influences or, as is very often the case, due to a heavy attack of hoppers. A bumper crop of blossoms may be entirely lost, turning a prospective good year into one of extreme scarcity. To study the problem of the so-called periodicity or biennial bearing solely on the basis of fruit crop records in the face of these well-known disturbing factors, a good part of which is beyond human control, is naturally not the proper course. The work reported in this paper has therefore been carried out on the above-mentioned basis, viz., that of blossom.

Material and methods. The material described in the preceding paper under this series provided the basis for the study on blossom-bud formation also. The flowering performance of the various classes of shoots described therein were collected during the various flowering seasons and the data presented in the following pages relate only to these.

Importance of leader shoots. The flowering records of the six different classes of shoots selected for study are set forth in Table I. A perusal of the figures brings out the supreme importance of leader shoots in determining the future crop. There is, however, an exception to the rule in the 'current year's' shoots. It is now possible to say that, in mangoes, flowers are largely borne on the preceding year's growth which may have emerged from the leaders that had either flowered or not flowered in that year. It is true that shoots of several years of age have also been noted to produce flowers in some cases, but rarely the fruits are carried to maturity on such

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shoots. For all practical purposes, therefore, branches over two years of age may be considered to play no important part in directly increasing the flower crop.

Performance of flowered and non-flowered leader shoots. The importance of flowered leaders in any given year for the production of flowers in the following season is also found to be as great as that of the non-flowered leader shoots of the same year. The general belief that shoots that flower in one year are incapable of producing a crop of flowers in the subsequent year is erroneous, since such shoots have not been found to differ statistically from the non-flowered shoots originated in the same year.

It must however be admitted that a shoot that flowers need not necessarily carry fruits to maturity. It has also been shown in the previous paper that de-blossomed shoots have different growth features and consequently different cropping potentialities from the shoots which carried fruits to maturity. It is possible that, apart from the possible influence of earlier or later vegetative growth or of shedding of flowers on the bearing of shoots, the inability of the fruiting branches to develop new shoots and mature them sufficiently early so as to produce a crop of blossoms in the next season is also a limiting factor.

Performance of 'current year's' shoots. In the case of 'current year's' shoots, mention has already been made that no significant difference exists between leaders and laterals regarding productivity. Much reliance cannot be placed on these data because of the lower number of shoots selected for study in *Mulgoa*. However, in *Neelum* and *Bangalora* a very much higher proportion of leader shoots are noticed to bear flowers in the following year, while in *Mulgoa* though the proportion of cropping shoots is less than that of laterals, it is nevertheless fairly high. These furnish an indication that, provided a good crop of leader shoots are produced in the first flush of any year along with the development of fruits, a good crop of blossoms can be predicted during the following year.

The laterals exercise generally little influence in determining the extent of flower crop in the following year or the year after that. Notwithstanding the single exception discussed above, it may be concluded from a general review of the entire data that, proportionately the laterals are of very much lesser importance than leaders in producing flower buds. But their importance in influencing the gross flower crop cannot be determined on the above basis, as this would depend not upon the percentage of flowering laterals but upon the number of laterals produced on a tree.

Performance of shoots that carried fruits to maturity. None of the shoots under observation that carried fruits to maturity in 1939 was seen to flower in 1940. This leads to the conclusion that the effects of flowering on the future performance of the shoots is not the same as that of fruiting. As has been pointed out in the previous paper shoots that carried fruits to maturity have produced fewer laterals on a smaller

proportion of shoots and registered very much less extension growth than the shoots that flowered but shed the flowers completely. The development of the fruit possibly draws more heavily upon the food reserves of the tree than the formation of blossoms, and this fact must naturally exert a profound influence on the future shoot performance.

Dissimilar reaction of varieties to 'off-' and 'on-year' bearing tendencies. Not a single shoot of any of the six classes in *Baneshan* has borne any flower during 1940. The year appears to be an 'off' one for the variety and presumably a very good one for *Mulgoa*. *Neelum* has borne a normal crop of flowers, while *Bangalora* had a crop that almost bordered on the "poor". Incidentally, these facts relating to four main commercial varieties growing together in a plantation indicate that all varieties do not respond uniformly to the factors, known or unknown, that bring about lean and good years in a mango tract.

Performance of lateral shoots. (a) *Influence of laterals on gross flower crop and regularity of bearing.* Every leader shoot is capable of functioning not merely as a single leader but may also produce a number of laterals Similarly, every lateral shoot is capable of producing in its turn numerous lateral growths. In as much as there are a larger number of laterals than leaders on a tree and that laterals are also found capable of producing flowers to some extent, it is to be expected that panicles borne by laterals may be far more numerous than those borne by leaders on a given tree. From this it may be inferred that, because of their large preponderance in number the laterals may influence the gross crop yield to a considerable extent.

The emergence of a high proportion of laterals during the flowering period as shown in Table III in the first paper of this series, and the fact that a large proportion of such shoots produce blossoms in the next season are points of great interest and economic importance, in that the production of flowers and of shoots that flower in the succeeding season go hand in hand every year thus ensuring regularity of bearing. *Neelum* is known for its regularity of bearing and this variety has also shown to be capable of producing a high proportion of lateral shoots. Thus, although the importance of leader shoots in determining the crop size has to be recognised, the equally great importance of lateral shoots, especially in varieties wherein they are produced in large abundance, in influencing the gross crop-yield and in ensuring regularity of bearing cannot be under-estimated.

(b) *Performance of laterals produced in 1938.* As in the case of leaders, reference to Table I shows that no significant difference in productivity exists between flowered and non-flowered lateral shoots. Contrary to the existing belief, this fact corroborates the previously drawn inference that the shoots that flower in one year are also capable of bearing flowers in the succeeding year, provided no fruits are carried to maturity on these.

(c) *Performance of lateral shoots originating in 1939 from the flowered and non-flowered leaders and laterals.* Table II shows that a

fairly high proportion of the fresh lateral shoots produced by the flowered and non-flowered leaders and laterals in any given year are capable of flowering in the succeeding year. It is further observed that there is no significant difference in the flowering tendency of the lateral shoots originating from different classes of shoots.

(i) *Performance of lateral shoots produced in 1939 on current year's shoots.* As is natural, the leaders and laterals produced during the first flush of 1939, i. e. the 'current year's' leaders and laterals are not expected to produce a large number of lateral shoots during the remaining part of the year. In *Bangalora* and *Mulgoa* such new growths have been totally absent, while in *Baneshan* their number is fairly high. But none of these has produced any crop in 1940. It may, therefore, be concluded that the laterals emerging in any given year from the shoots produced in the same year are valueless for producing a crop of flowers for the succeeding year.

Period of emergence of laterals in relation to flowering. Owing to the practical difficulty in obtaining an adequate number of laterals emerging every month from April 1939 to January 1940 in each of the six classes of shoots in these varieties, it has become impossible to ascertain the relationship between the period of emergence of lateral shoots from each of the six classes of shoots and their flowering potentialities. However, the flowering performance of the varying number of new laterals emerging in 1939 during the different months in these three varieties has been studied. The data are presented in Table III. It is seen that April and May are the most important months for the production of new laterals from the point of view of flower production.

Relation between length of shoots and blossom bud formation. Examination of the data relating to the flowering frequencies of shoots of various lengths in two varieties, viz. *Neelum* and *Bangalora*, has shown that the flowering shoots in both leaders and laterals show medium variation with high frequency of growth in the middle ranges of growth and the non-flowered groups exhibit either very high or very poor extension growth. In other words, the modal class is situated at the ends of the range in non-flowered leaders and laterals. It may, therefore, be concluded that shoots of medium length are most fruitful.

Duration and extent of growth and growth cessation in relation to flowering. Observations extending over four flowering seasons have shown that increased vegetative growth is immediately followed by low flower production or vice versa, and that trees which ceased growth early, say by the end of May, are most prolific in bearing, while those in which the growing period was prolonged up to July or August, or which showed growth activity in the season immediately preceding the flowering period failed to produce good crop. An early cessation of growth during the first lush as well as a definite dormant period immediately preceding the

flowering season are therefore vital for the formation of a good crop of flower buds

It will be recognized that all the above mentioned favourable conditions for flowers-bud formation are subject to be considerably influenced by the prevailing seasonal conditions and to a certain extent by the orchard cultural practices

Discussion On the basis of independent studies, Singh and Naik (1933), Galang and Lazo (1935), Sen (1939) and Singh and Khan (1939) in mangoes, and Roberts (1929) and Swarbrick and Naik (1932) in apples, have shown that a number of factors associated with tree growth are intimately connected with the subsequent performance of those trees. From such definitely established relationship it has been found possible to predict in some instances the future tree performance with some exactitude and also to shape the growth of the trees in a manner most conducive to optimum production. A number of workers like Hodgson and Cameron (1935) and Marseille (1937) have studied the relationship between certain climatic factors and tree performance, while Brown (1936) and Bane (1939) have pointed out the various cultural practices by which the tree-growth can be regulated in the desired channel. These various investigations serve to lift the fruit growing industry from the empirical to the scientific sphere. It is on these lines that the Indian mango industry can hope to tide over the present uncertainty and ensure reasonable returns to the grower by guaranteeing regular cropping in desired bulk. The underlying objectives of the present investigations revolve upon this principle of imparting the exactness to the erstwhile 'hit and miss' method by furnishing a correct understanding of the relationship between various growth features and productivity.

One of the outstanding points emerging from this study, is that in any investigation of the problem of blosom-bud formation in relation to growth features, grouping of all classes of shoots into a single category will be valueless. It has been clearly shown that each of the six classes of shoots in mango included under this study possesses different growth features and flowering potentialities. It is, therefore, amply borne out that the conclusions drawn on the basis of a single class of shoots will not be valid except in affording broad indications, particularly in regard to the growing season, and growth as influenced by performance in the previous season. Some of the interesting results such as the relation between flowering and the different classes of shoots, and that between the extension growth of shoots and blossom-bud formation and again between regularity of bearing and the characteristic growth features of the variety can only be obtained by a study of the growth features of each class of shoots separately.

The data emphasise that, despite wide variation in the nature, extent, and period of growth among the individuals, there is some easily definable relationship between flower-bud formation and growth features in the preceding season. Since growth in its turn is influenced by a variety of factors uch as seasonal conditions, tree-metabolism and cultural practices, it is

necessary to understand the correlations of all these factors for comprehending the contributory causes of productivity.

It has been commonly assumed that there is a definite periodicity in mango production. Hartless (1914) and Burns and Prayag (1921) have adduced data to show that lean and good years alternate with each other almost without exception. Popenoe (1927), while admitting that biennial bearing possibly exists in some varieties, has found that heavy production in *Mulgoba* occurs on an average once in four years in Florida. In a general discussion on bearing in mangoes, Sen (1939) and Singh and Khan (1939) have maintained that biennial bearing is an established feature, although no definite evidence has been furnished by them in support of this assertion. Data collected in a mixed plantation at Kodur (Naik, 1940) have shown that good or bad cropping years occur at indeterminate and irregular intervals and do not conform to any alleged conception of rhythmic or cyclic production. The position at present, therefore, is one of dispute, and this is perhaps attributable mainly to the fact that the different workers have adopted dissimilar approaches to the study of the problem and have based their inferences on dissimilar varieties grown under widely varying conditions.

Taking the extent of flowering as the proper basis, the first direction to which attention is to be properly diverted is towards the growth features during the seasons preceding the flowering period. It has been shown in the present paper that flowers are borne on leaders as well as lateral shoots. The number of shoots of each of these classes varies in a tree to some extent as does also the proportion of each of these classes of shoots to bear flowers. If the leader shoots by themselves are more important as a class for flower production, the lateral shoots, because of their large number are of equal importance. The former class of shoots occur as extension growths, while the latter are formed mainly from around the tips of shoots which have ceased growth previously. A large number of such lateral shoots also occur around the tips of shoots that have borne flowers. It, therefore, follows that in the case of a tree which has borne a very heavy crop of flowers, a large number of lateral shoots develop either during the time of flowering itself or a little later. Even among that class of shoots which fail to produce flowers, a number of laterals originate from the terminal rosette of such shoots. Data have been adduced to show that some proportions of all these classes of laterals produce flowers in the next season although the extent may vary according to varieties, age and genetic make-up of the trees. Since the production of a very large number of laterals has been proved to occur in every year all the four varieties under study, and since a proportion of such laterals has been shown to be capable of producing flowers in *Neelum, Bangalora* and *Mulgoa*, it seems to be clear that these three varieties at least, are not prone to biennial or periodic bearing. It must be stated that these three varieties bore a fair to good crop in this tract during 1939, and the former two varieties again produced almost the

same size of crop during 1940. *Bangalora* registered a crop of slightly lesser size in 1940 than in 1939. Failure of shoots of *Baneshan* to flower in 1940 has already been shown to be due to the longer period of growth of the shoots in the first flush and its vegetative activity in the season immediately preceding the flowering period, and cannot therefore be due to the fact that this variety was in the 'off' year. If the latter be the case, a similar feature should have been evident in the other three varieties also either during 1939 or during 1940, both of which years cannot be definitely termed as lean years for these varieties.

It has to be remembered, however, that growth is influenced by a number of factors, each of which may vitally influence its course and extent, and through these, ultimately the productivity. It has been stated by some workers that a heavy cropping year is followed up by no crop in the same tree or a variety. But this is only a half-truth ; for apart from the fact that the individual trees constituting a variety differ markedly in their productive capacity as well as in their ability to bear regularly from year to year, the effects of a heavy crop of flowers are quite different from those of a heavy crop of fruits. The former, if it does not carry a large number of fruits to maturity may result in a good crop of laterals which may, in turn, be responsible for the production of a good crop in the succeeding year. On the other hand, in the latter case, imagining an extreme instance, it is possible to conceive delay in lateral shoots formation and poor extension growth or complete non-appearance of laterals and consequently of poor or no crop in the succeeding season. Not only such extreme instances do not occur in the case of every tree of a variety, but there are also numerous other modifying influences which seem to make it impossible for the regular occurrence of this so-called biennial or periodicity of bearing in mangoes. Favourable weather or cultural practices at the proper time may force vegetative growth during the blossoming period or it may extend the growth too late in the season. In the former case the crop is adversely affected for that season, while in the latter case trees are rendered partly or completely unfruitful during the succeeding year. Heavy rains during the blossoming period, insect and fungoid diseases, strong gales, prolonged dry spells, artificial cultural practices such as ringing, pruning, smudging, notching, deep ploughing, grassing, manurial and irrigational practices and also varietal peculiarities such as off-season or second flowering capacities may all exert their individual and cumulative influences which will ordinarily render the regularity of biennial or periodic tendency in mangoes a practical impossibility. It is, however, admitted that the influences of certain environmental conditions may exert on such a wide scale as to destroy the crops of a whole tract in one year with a better crop prospect for the next year. But such adverse influences do not naturally occur according to the set plan of the alleged biennial or periodic bearing phenomenon.

More than all, the belief in biennial bearing does not take into account the extreme variability in the genetic make-up of mango trees. It has been

shown by the senior author (1940) from a study of a number of varieties over a four-year period that, there is a wide variation in tree-yield, and that the proportion of productive or regular bearing trees over a given period of years varies from year to year. That there are as many as 100, 92, 84 and 100 per cent consistently poor-cropping individuals in *Mulgoa*, *Bangalora*, *Neelum* and *Andrews* respectively during a four-year period is a definite testimony against the existence of the so-called biennial or periodic bearing in mangoes. It is possible to visualise fairly uniform performance in a plantation planted to standardized root-stock and scion varieties. But this is an achievement that can be but a fond hope at present Realising the unstandardised production of mango trees in Indian nurseries, it is essential to make due allowance for the extremely varying performance in Indian mango plantations—a feature that ill-fits the belief in biennial bearing.

Summary and conclusions. In mangoes, a definite relationship is found to exist between various growth features and blossom-bud formation.

No significant difference is observed between flowered and non-flowered shoots with regard to flower production The general belief that, shoots that flower in one year are incapable of producing a crop in the succeeding year, is therefore, erroneous.

Mango flowers have been found to be borne largely on the shoots that originate in the first flush of the previous year.

Although a higher percentage of leaders than laterals bear flowers, the latter shoots because of their great abundance on a tree exert a profound influence in increasing the gross flower crop.

None of the shoots that carry fruits to maturity seem to bear in the succeeding year, which means that this class of shoots is less efficient than that in which the flowers shed early or in which flowers were not produced in that year.

An early production of lateral shoots during the first flush, an early cessation of growth during the same flush and complete dormancy in the season immediately preceding the flowering period, seem to be conducive to regular bearing in mangoes.

Heavy flowering is followed by retarded tree activity in the following growing season.

The available data and the knowledge on the nature of bearing in mangoes indicate that biennial bearing is not an established feature and that the incidence of lean years at unregulated intervals is due to factors other than those associated with the natural growth tendencies of the mango..

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TABLE I.

Mean flowering performance of the various classes of shoots in mangoes.

A. Non-flowered leaders. B. Non-flowered laterals.
C. Flowered leaders. D. Flowered laterals.

	A	B	C	D	G. M.	S. E.	Significant or not.	Critical difference. (P=0·05)
Mean number of flowering shoots per 100 selected shoots	40·33	20·67	43·67	17·67	30·58	6·31	Yes.	15·40
Mean number of flowering shoots as percentage of general mean	133·09	68·10	144·11	58·31	100·00	20·82	Yes.	50·82

Conclusion—C, A, B, D.

'Current year's' shoots.

Varieties.	Current year's leaders	Current year's laterals.	Mean.
Neelum	36	19	27·5
Bangalora	20	9	14·5
Baneshan	49	80	64·5
Mean	35·0	36·0	General Mean 23·7

Difference between leaders and laterals for P=·05—Not significant.

TABLE II

Mean performance of the lateral shoots produced by the different classes of shoots.

A. Non-flowered leaders. B. Non-flowered laterals.
C. Flowered leaders. D. Flowered laterals.

	A	B	C	D	General mean.	S. E	Significant or not.	Critical difference. (P=0·05)
Mean performance of the lateral shoots produced by the different classes of shoots	39 0	37 0	31·5	9·0	29 1	16·07	Yes	39·2
Mean performance as percent of general mean	132·6	125·8	107·1	30 6	100·0	54·68	Yes	133·3

Conclusion $\overline{A, B, C, D}$

TABLE III

Flowering performance of the lateral shoots produced during the different months of 1939 *

A—April, B—May, C—June, D—July, E—October.

	A	B	C	D	E	General mean.	S. E.	Significant or not.	Critical difference (P=0·05)
Mean performance of lateral shoots	60·0	47 0	13·5	10·5	7·5	27 7	6·97	Yes	19·4
Mean performance as percent of general mean	222·0	173·9	49 9	38 9	27 8	100·00	25·78	Yes	71·7

Conclusion $\overline{A, B,}$ $\underline{C, D, E}$

* No shoots were produced in September 1939 and January 1940, while those produced in August, November and December 1939 failed to flower in 1940.

Crop Production in Kovvur Taluk (W. Godavari).

By A. SANKARAM, B. Sc. (Ag.).

Introduction. Of the different problems concerning Indian agriculture, the need for increase in the production of food crops is one that is receiving wide attention at the present time. The problem has sprung into prominence with the outbreak of the war, and assumed importance all over the country. With the introduction and spread of cash crops, the area under food crops gradually went down. Among the cash crops the Virginia tobacco in certain parts of this presidency is to a certain extent responsible for this change. The assured and ready market which facilitated the conversion of the cured stuff into coin, coupled with its suitability as an alternative crop to some of the food crops grown in the dry lands, that fetched very low returns, gave the necessary impetus to the farmers to take up to the cultivation of virginia tobacco. These two encouraging factors were mainly responsible for the rapid and extensive spread of this crop in Kovvur taluk of the West Godavari district during the past five years. Many a farmer has even migrated into the neighbouring taluks in quest of suitable land for raising this crop.

In general the enormous increase in the cultivation of Virginia tobacco during the last four years reduced considerably the acreage under food crops, and exercised a deleterious effect on the soil which was cultivated without rest or rotation. Insufficiency of fodder and grazing for cattle was also keenly felt.

With a view to ascertain these effects in detail a close study was made of the agricultural conditions before and after the introduction of the tobacco crop and the results of this study are presented in this paper.

Season and rainfall. The season generally commences with the South West monsoon which sets in by about the beginning of May. The monsoon brings a fair amount of rainfall which helps the sowing operations of *Budama* paddy, redgram, gingelly and cotton. The North East monsoon sets in by about the middle of September and in this season also a fair amount of rainfall is received. An early break of this monsoon with heavy precipitation interferes with the harvest of the dry land crops, causing a great loss to the dry land farmer. With the cessation of the North East monsoon the winter crops such as coriander, horsegram and blackgram, are sown by about November. The summer season begins by about March and the period extends till the break of the South West monsoon. A few mango showers are generally received during the summer months. The *tholakari* (June to September) is best suited for the sowing of crops in the dry lands that form a major part of the taluk. The Virginia tobacco crop that is cultivated in the dry land stands in the field from October to middle of March. The general seasonal conditions that prevail during this period are very

favourable for successful cultivation of this crop. The average monthly rainfall of ten years (1932-41) is given below.

Rainfall average of ten years.

Month.	Rainfall in inches	No. of rainy days.	Month.	Rainfall in inches.	No. of rainy days.
January	·002	·01	July	9·124	19·90
February	·963	2·90	August	6·839	15·10
March	·889	2·00	September	6·428	12·90
April	1·274	3·20	October	6·885	10·20
May	2·057	3·60	November	2·858	4·80
June	5·813	11·80	December	0·097	0·80
Total	10·996	23·51	Total	32·281	63·70

System of cultivation. The wet cultivation occupying a minor part of the total area is mostly confined to the western corner of the taluk. The chief crops of the wet land are paddy and green manure crops. Fruits and vegetables are cultivated in the garden lands irrigated from wells. Other crops of the garden lands are chillies, onions, and turmeric. The major part of the taluk is under dry cultivation, the chief crops being paddy, millets, tobacco and coriander. The soils of the dry land are of two types, black and red. It is in the dry fairly heavy black soils that the Virginia tobacco crop has taken a firm footing replacing the dry paddy and millets. The relative distribution of the total cultivable area under the different systems of cultivation is given below:—

Utilisation of land area in Kovvur taluk (1940—41).

Nature of utilisation.	Area in acres.
Total cultivable area	116189
Not available for cultivation	12345
Cultivable waste other than fallow	1283
Net area cropped	124381
Area unirrigated	107907
Area irrigated	16474
Canals	6499
Tanks	8178
Wells	1132
Other sources	665

Crops and rotation. Under the wet system of cultivation paddy is followed by *pyru* gingelly, sunhemp for fodder or green manure, green-gram, or blackgram. The garden land farmer generally follows a three course rotation of chillies, groundnut and vegetables like brinjals, *bendai* or gourds. Prior to the introduction of virginia tobacco, the entire dry land used to be sown with a variety of crops soon after the break of the South West monsoon. Dry paddy and gingelly are grown as pure crops. Red-gram is raised both as a pure and a mixed crop with dry paddy, *gogu* and other pulses. The tobacco crop is now grown with practically no rotation.

Effects of Virginia tobacco on crop production. Four outstanding changes in crop production after the introduction of Virginia tobacco are presented below,

1. *Changes in crop production.* There was a fall in the production of food crops and the extent to which the non-food crops, particularly the Virginia tobacco, was responsible for this change, during the past seven years (1935—42) is shown in the statement given below.

Crop Areas of Kovvur Taluk (1935—1942).

Particulars.	1935–36	1936–37	1937–38	1938–39	1939–40	1940–41	1941–42*
1. Total area sown with all crops	128074	128479	115788	127226	120370	128745	128812
2. Food crops	90296	92197	78605	85246	83107	83499	79212
3. % of food crops to the total area sown	70·5	71·7	67·8	67·0	69·0	64·8	61·4
4. Wet paddy area	15840	15786	15886	15898	15872	15903	15912
5. Dry paddy area	21032	22076	20285	23523	19936	20150	18304
6. Non-food crops	37778	36282	37183	41980	37263	45246	40600
7. % of non-food crops to the total area sown	29·5	28·3	32·2	33·0	31·0	35·2	38·5
8. *Natu* tobacco area	2768	2740	2570	2798	3179	2016	2112
9. Virginia tobacco	Nil	6	105	200	1750	8540	12474
10. Total tobacco area	2768	2746	2675	2998	4929	10556	14586
11. % of Virginia total non-food crops	Nil	0·01	0·28	0·47	0·46	18·8	27·1
12. Net area sown	121002	120477	109676	120105	115943	122381	123122

* Estimated figures. All figures in acres.

The figures reveal that,

i. The percentage of area under food crops showed a gradual decline from 1935 to 1942 while that of the non-food crops showed a corresponding increase, the total area sown varying very little during the period.

ii. Among the food crops, dry paddy particularly suffered considerably, having been replaced by Virginia tobacco, (the wet paddy area remained the same during the period under review).

iii. Of the area under non-food crops, the Virginia tobacco figured prominently with a maximum percentage of 27·1 during the year 1941-42. The variations in area under *natu* tobacco are very little.

iv. The decrease in the acreage of food crops was marked from the year 1939 with the spread of Virginia tobacco crop.

2. *Quality of the tobacco crop.* In the heavy clayey and highly retentive black soils of the Guntur district, reputed to produce the highest class of tobacco, the quality appears to have fallen in recent years owing to soil deterioration consequent on the continuous growing of the crop on the same land year after year. The deterioration of the quality of the crop produced on these ideal soils was pronounced only after a decade. But in the soils of the Kovvur taluk, the quality of the crop produced seems to have deteriorated even in such a short period of four years after its introduction. This is reflected in the larger proportion of low grade tobacco

obtained when the crop is raised on the same land for three successive years.

In no crop is quality so important as in tobacco. The net income is more dependent on the quality of the produce than the outturn per acre. Hence the need for adopting proper cultivation methods and rotations.

3. *Problem of cattle fodder.* That agriculture and cattle are inter-dependent is well known. It is admitted on all hands that the livestock of our province is particularly underfed as the amount of food produced is insufficient for the large number of animals maintained by individual farmers inconsistent with their needs. By the fall in the production of food crops, the quantity of straw and other bye-products of these crops which served as fodder for the cattle of the taluk, has decreased. Besides even the existing the adequate grazing grounds are illmanaged. The situation can be improved by the reduction of the livestock to the bare necessity of the farmers and by a change in the present agricultural policy with a view to grow more food crops in each holding and to include fodder crops in rotation.

4. *Rental value of dry lands.* A noteworthy feature of the introduction of the Virginia tobacco crop in the dry lands of the taluk is the abnormal rise in the rental values. This recorded a minimum of Rs. 80 and a maximum of Rs. 120 per acre during the current year, 1941-42. With the increase in rental value the price of land has shot up to Rs. 500 per acre which is eight to ten times the value of the land prior to the introduction of this crop. Of late the marked fall in the outturn and the quality of the leaf, coupled with the increased cost of production of the same owing to the enormous rise in prices of the basic materials required for curing and processing of the leaf, have caused distress among growers of Virginia tobacco. Though the profits have fallen they are still higher than for any other food crop of the dry lands.

Another effect of the spread of Virginia tobacco, is the growing scarcity for labour for agricultural operations in the taluk. The abnormal rise in the wages is apparent during the tobacco curing season (January to April).

Conclusion. The spread of Virginia tobacco crop is the one limiting factor for increasing the area under food crops in the Kovvur taluk of the West Godavari district. An effective switch-over to food crops in the cropping plan of the taluk is an immediate necessity. Other cash crops, each in its own way and in its particular tract, are similarly responsible to a certain degree for this live problem of food production. It is not the object of this paper to discourage the growing of cash crops but to stress the need for the adoption of balanced agriculture by all the farmers with a view to be self-sufficient.

Acknowledgements. The writer is deeply indebted to Sri C. Venkatachalam, B. Sc. (Ag.), Agricultural Demonstrator, Kovvur, for his ungrudging and helpful criticism on the paper. Thanks are also due to Sri K. Bhaskaram, B. Sc (Ag.) for his kind assistance in the preparation of this paper.

Studies on *Stomopteryx nerteria* Meyr—A Pest of Groundnut in the Madras Presidency.

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Introduction. Groundnut (*Arachis hypogoea)* is attacked by a number of pests of which the hairy caterpillar (*Amsacta albistriga* M.) and the *surul* moth (*Stomopteryx nerteria* Meyr.) are the more important. Meyrick (1906) has described the moth under *Anacampsis nerteria.* Fletcher (1914 and 1917), Lefroy (1909) and Ramakrishna Ayyar (1940) have given short accounts of the pest; detailed information is however lacking. Studies on the pest were therefore taken up at the Agricultural Research Station, Tindivanam (South Arcot district) and the results thereof are presented in this paper.

Food plants and distribution. Besides groundnut, the pest is reported on Soy bean, redgram and *Psorolea corylifolia.* The pest has been noted in Ceylon; in India it has been reported from Madras, Nagpur, Pusa and North West Frontier Province. In the Madras Presidency it has been recorded from a number of districts such as Coimbatore, South Arcot, Salem, Trichinopoly, Tanjore and Chingleput.

Nature and extent of damage. The larvae immediately after hatching mine into the leaves; later they come out and web together the leaves and feed on the green matter. As a result of the attack the leaves get dried up. If the caterpillars are found in large numbers there is serious damage to the crop. Droughty conditions seem to favour the multiplication of the pest. The attack is severe in the rainfed crop (July-August to December-January) while it is light in the irrigated crop (February-March to June-July) as seen from the catches of moths given in Table I. In the rainfed crop the pest infestation reaches the peak in months of September and October as disclosed by the moth catches.

TABLE I. Catches of moths at the light trap.

Month.	1939	1940	1941
January		957	119
February		160	6
March		24	12
April		48	11
May		192	54
June		3,603	1,182
July	2,565	12,483	
August	338	11,293	
September	17,203	35,846	
October	10,095	15,856	
November	1,455	103	
December	1,242	172	

Life history and habits of the pest. *Moth.* Male and female 8-10 mm.; abdomen grey; forewing dark grey with a white spot on the upper margin towards the apical end; hindwings and cilia light grey. The

maximum longevity of the moth was 36 days; without food it did not live for more than four days. The maximum number of eggs laid by a female was 473; the average for 14 moths being 185 8. Table II gives the egg-laying records of 14 moths. (December 1940 and January 1941.)

TABLE II. Egglaying records of 14 female moths

S. No.	Number of eggs laid per day.																
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	Total.
1	30	56	42	15	5	6	34	9	...	..	..	...	..	.	..	...	197
2	30	77	13	19	31	9	6	15	9	4	7	6	3	2	2	...	242
3	98	63	13	40	89	37	61	36	22	4	7	3	...	...	..	...	473
4	10	19	18	27	15	16	3	2	3	6	...	...	...	...	...	...	119
5	15	52	43	48	22	14	13	14	13	6	8	...	...	...	...	...	248
6	22	28	17	15	10	9	9	5	6	4	...	...	...	...	...	...	125
7	23	17	21	18	14	31	17	11	12	7	3	1	4	2	3	...	184
8	41	15	8	23	14	5	8	1	23	5	25	12	.	...	...	...	180
9	12	15	39	31	44	31	9	15	11	5	6	6	3	...	...	...	227
10	11	25	18	28	26	29	11	4	...	...	...	...	...	...	...	...	152
11	4	19	27	18	15	6	11	16	7	1	2	2	2	1	1	1	133
12	21	20	15	6	16	20	8	7	...	..	...	...	..	...	...	...	113
13	13	16	19	10	16	14	3	12	6	14	3	9	5	...	...	...	140
14	12	5	11	19	3	18	.	...	.	.	...	..	.	...	..	...	68

Egg. Eggs are generally laid two to three days after emergence of the moths. They are pale white in colour when freshly laid; on the second day they turn pale yellow; on the third day they are light brown. When the eggs are about to hatch they become dark. The egg period is generally three days and in some cases exceeds by a day.

Larva. The newly hatched larva is creamy white in colour with dark head and measures 1 5 mm. long and 0 5 mm. broad. The mature larva is about 8 mm. long and 1 mm. broad. When full fed the larva pupates on the plant between two leaflets which it webs together. The larval period is 9 to 17 days.

Pupa. The pupa is pale yellow when just formed; later it becomes deep brown. It measures 4 to 5·5 mm long and 1 to 1·5 mm. broad. The pupa is enclosed in a delicate cocoon. The pupal period is three to seven days. The various stages of the pest are found to extend by a few days in the cold weather.

Total life cycle and number of generations. Table III gives the life cycle records of 30 moths. The life cycle varies from 15 to 28 days. In the rainfed crop season the pest passes through five to six generations.

Incidence in relation to varieties. Thirtyfive varieties of groundnut including bunch and spreading types were studied for resistance to *Stomopteryx*. The varieties were grown in replicated plots. In each replication 25 plants were selected at random and the number of larvae and pupae counted on each plant Counts were taken for three months, viz., September, October and November. The results were analysed statistically. The data collected so far have shown that no variety was immune from attack, that the bunch varieties were not found significant for low population of the pest, and that the spreading types A. H. 62, A. H. 73, A. H. 692 and A. H. 675 were found carrying significantly low population of the pest.

TABLE III. Life cycle records of 30 moths

Serial No.	Eggs laid on	Eggs hatched on	Egg period in days	Larva pupated on	Larvae period in days	Adult emerged on	Pupal period in days	Total life cycle in days.
1	24—2—40	27—2—40	3	15—3—40	17	20—3—40	5	25
2	,,	,,	3	,,	17	,,	5	25
3	11—6—40	14—6—40	3	28—6—40	14	3—7—40	5	22
4	,,	,,	3	,,	14	,,	5	22
5	,,	,,	3	,,	14	,,	5	22
6	28—6—40	1—7—40	3	12—7—40	11	17—7—40	5	19
7	,,	,,	3	10—7—40	9	13—7—40	3	15
8	29—7—40	1—8—40	3	10—8—40	9	14—8—40	4	16
9	,,	,,	3	,,	9	,,	4	16
10	,,	,,	3	,,	9	,,	4	16
11	,,	,,	3	,,	9	,,	4	16
12	,,	,,	3	13—8—40	12	18—8—40	5	20
13	,,	,,	3	,,	12	,,	5	20
14	,,	,,	3	11—8—40	10	15—8—40	4	17
15	,,	,,	3	,,	10	,,	4	17
16	,,	,,	3	,,	10	,,	4	17
17	,,	,,	3	,,	10	,,	4	17
18	,,	,,	3	,,	10	,,	4	17
19	,,	,,	3	12—8—40	11	,,	4	18
20	,,	,,	3	,,	11	,,	4	18
21	,,	,,	3	,,	11	,,	4	18
22	,,	,,	3	16—8—40	15	,,	4	22
23	,,	,,	3	,,	15	,,	4	22
24	17—8—40	20—8—40	3	2—9—40	13	7—9—40	5	21
25	,,	,,	3	,,	13	,,	5	21
26	19—8—40	22—8—40	3	31—8—48	9	4—9—40	4	16
27	23—12—40	27—12—40	4	13—1—41	17	19—1—41	6	27
28	,,	,,	4	,,	17	,,	6	27
29	,,	,,	4	,,	17	21—1—41	7	28
30	,,	,,	4	,,	17	,,	7	28

Natural enemies. Two pupal parasites—*Brachymeria plutellophaga* Gir and *Eupelmus* sp. near *anpingensis* Mani and four larval parasites—*Apanteles* sp, *Microbracon* sp., *Perisierola* n. sp. and *Chelonus* n. sp. near *malayana* have been noted so far.

Behaviour of the moth in response to light. Preliminary trials have shown that (1) a light placed at the ground level attracts more moths than those kept at 5 ft. and 10 ft. above the ground, (2) white light attracts more moths than green and red lights, (3) the moths are attracted throughout the night, (4) more moths are attracted from 6-30 to 10-30 P. M. and 2-30 to 4-30 A. M. than during the rest of the night, and (5) a 'Hurricane' light attracts less moths than a Petromax light (200 c. p.).

Acknowledgments. The authors have to thank Sri C. M. John, Oil Seeds Specialist and Sri C. R Seshadri, Superintendent, Agricultural Research Station, Tindivanam, for affording excellent facilities for the study of the pest.

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THE MADRAS AGRICULTURAL STUDENTS' UNION

The Annual General Body Meeting, 1942.

The annual general body meeting of the Madras Agricultural Students' Union was held on Tuesday the 27th October 1942 at 6 P. M. in the Freeman Hall with Mr. C. R. Srinivasa Ayyangar, Vice-President in the chair. The total number of members present was 100. The secretary read the minutes of the last General body meeting and the report of the Managing Committee for the year 1941—42. The audit report and budget for 1942—43 were then taken into consideration. Sri C. S. Krishnaswami rose to point out that the committee should have consulted the General Body or at least the Council before deciding the abandonment of the College Day and Conference in July 1942. The secretary suitably replied. Rao Bahadur V. Ramanatha Ayyar wanted explanation for the excess expenditure under 'Journal' and suggested that this excess should be ratified by the general body. After the reply of the secretary in this connection, the excess expenditure was ratified by the general body unanimously. He next proposed that under office expenses an item 'postage' should be included providing Rs. 50 and under 'miscellaneous' the amount should at least be doubled. This was agreed to by the general body. The Students' representative proposed that the amount under Journal be increased by Rs. 75 so that the total amount available for the publication of the Students' Supplement may be Rs. 125. After some discussion the general body agreed to the sharing of the expenses for this publication by the students and the Union in the proportion of 40% and 60% respectively. The audit report and the budget were then passed unanimously.

Election of office bearers for 1942—43 was then taken up and the Chairman announced the results of the voting by ballot as follows :—

Vice-President :—	Sri N. L. Dutt.
Editor :—	Sri C. M. John.
Secretary :—	Sri S. V. Duraiswami Ayyar

Election of the other office bearers was proceeded with and the following were elected for the Council, the Managing Committee and the Editorial Board :—

Mofussil Vice-Presidents :— Sri R. Swami Rao, Dr. A. Subba Rao and Sri K. C. Naik.

Mofussil members for the council :— Sri V. Sriraman, Sri. K. Raman Menon Sri. C. Venkatachalam, Sri. M. Rami Reddi.

Resident members for the council :— Sri V. T. Subbiah Mudaliar, Rao Sahib V. Muthuswami Ayyar, Sri T. Venkataramana Reddi and Sri G. Prabhakara Reddi and Sri T. M. Venkataraman (student)

Manager :—	Sri T. Natraj.
Treasurer :—	Sri M. S. Purnalingam Pillai,

Members of the Managing committee :— Sri V. Gomathinayagam Pillai, Sri C. Balasubramania Mudaliar, Sri S. Rajaratnam Mudaliar, and Sri R. Subramaniam and T. M. Venkataraman (students).

Editorial Board :— Sri C. Vijayaraghavan, Sri C. S. Krishnaswami, Sri M. A. Sankara Ayyar, and Sri K. V. S. Suryanarayanamurthi and T. M. Venkataraman (students).

The Secretary proposed a hearty vote of thanks to all the members present. A vote of thanks was proposed by Sri C. S. Krishnaswami for the retiring Committee and Editorial Board. The meeting then dispersed.

Report of the Managing Committee of the Madras Agricultural Students' Union for the year 1941—42.

The Managing Committee of the Madras Agricultural Students' Union beg to present the following report of the activities of the Union during the period June 1st. 1941 to May 31st. 1942.

Membership. The number of members on the rolls on the 31st May 1942 was 502 as against 496 in 1941 and 503 in 1940. A large number of the officers of the Department and ex-students of the college are still not members.

Office-bearers Mr. R. C. Broadfoot continued to be the President of the Union till the 20th January 1942 on which day he took leave preparatory to retirement. Rao Bahadur G N. Rangaswami Ayyangar who succeeded him as Principal became the President and on his taking similar leave from March 10, 1942, Mr. P. V. Ramiah, who was appointed Principal, became the President.

General Body Meeting. Except the annual general body meeting held on the 13th July 1941, there was no occasion to call for any meeting of the general body.

Meeting of the Managing Committee Eleven meetings of the Managing Committee were held during the year.

Editorial Board. Mr. K M. Thomas who was elected as a member of the Editorial Board resigned his membership and in his place Dr N. Krishnaswami was elected as a member by the Editorial Board. Thirteen meetings of the Board were held during the year. We have great pleasure in recording our thanks to Mr. S. N. Chandrasekhara Ayyar, the Editor and to the other members of the Editorial Board for the efficient conduct of the Journal during the year.

The Madras Agricultural Journal. The Journal was continued to be published regularly and promptly. A fairly good number of papers was received for publication and we have great pleasure to record our thanks to the several authors who contributed to the success of the Journal. We take this opportunity to appeal once again, as we have done in previous years, to the officers of the Department, especially those working in the districts, to evince greater interest in the Journal by contributing popular papers on agricultural and allied problems The Students' Annual Supplement was published this year in May 1942. We wish to add that due to the enhanced cost of paper and printing materials, we had to reduce the size of the Journal to keep ourselves within the budget. We hope that our contributors and readers will realise the situation. In the publication of the Journal, we record our appreciation of the co-operation and promptness of our printers " The Scholar Press, Palghat."

Subscribers. The number of subscribers to the Journal at the end of the period was 227, as against 211 in 1941 and 215 in 1940.

Exchange and Free list. Thirty six journals, Indian and foreign, were on the exchange list and eight journals were being supplied free to abstracting journals, newspapers and libraries The journal could not be sent this year to foreign countries due to the war situation, but they have been reserved for despatch when shipping conditions improve.

Subsidy to the Madras Agricultural Journal. As you are aware, the Government of Madras were pleased to sanction a recurring annual grant of Rs. 400 to the Madras Agricultural Students' Union from 1942—'43 for improving the scope and utility of the Journal. We are glad that our efforts through a number of

years have at last borne fruit. We once again record our grateful thanks to the Government for the same. The thanks are gratefully to Mr. P. H. Rama Reddi our Director of Agriculture for his efforts in securing this grant.

The extension of the Union Building. The extension of the Union building for which Rs. 1060 was sanctioned last year was taken up during the year. The estimate prepared was sent by the Director of Agriculture to the Department of Public works for their technical approval. The latter made certain alterations which enhanced the original estimate by Rs. 200. The estimate was returned to us with an endorsement by the Director of Agriculture that the suggestions of the Public Works Department are to be carried out. Due to the difficulty in securing suitable building materials the work did not progress as quickly as it normally would. On the 31st May, only Rs. 105-5-0 was spent and we have provided in the current year's budget presented before you now, Rs. 875 to complete the work carrying out the changes made by the Public Works Department in the estimate. A compensation of Rs. 75 was sanctioned to the contractor to meet the high cost of building materials that unexpectedly rose up since he entered into an agreement with the Union. The building is now complete. A hall about 20 feet by 15 feet has now been provided which affords sufficient space for meetings of the Managing Committee and the Editorial Board. Racks and other equipments to the hall are under preparation. The expenditure during the current year under the 'Improvement to Building' will be well within the provision of Rs. 875 provided for in this year's budget. We are glad to record here our heart felt thanks to Sri C. Narasimha Ayyangar, the Estate Civil Engineer and Sri G. K. Valiswara Ayyar, his Assistant, who rendered ungrudging technical help in the execution of this work.

Ramasastrulu Munagala Prize. The prize was announced to be awarded this year for an account of original research on any agricultural subject. Only one paper was received and the judges to whom it was referred, did not recommend the award. We take this opportunity to record our thanks to the judges.

Acknowledgements. We have great pleasure to record our grateful thanks to the various members of the Union who helped and co-operated in its various activities during the period under report. Our thanks are due to Dr. C. R. Reddi Vice Chancellor, Andhra University, who was kind enough to preside over the Conference in 1941 and to Mrs. Imamuddin, who distributed the prizes to the winners in the College Day Sports. Our thanks are also due to Mr. A. Mariakulandai for conducting the sports successfully, to Mrs. and Mr. C. M. John who arranged to entertain the guests at tea on the sports day, and to the convenors and members of the various sub-committees who whole heartedly helped us in the conduct of the College Day and Conference. We offer our thanks to Mr. C. Williams of the Forest Department for lending tents and chairs. Finally we have to place on record the grateful thanks of the Union to Mr. R. C. Broadfoot who was our President for a number of years. He was always kind and sympathetic and ready to help and guide the Union in all its activities. He has now retired and we wish him a happy and peaceful time in his retirement. Our thanks are also due to Sri Rao Bahadur G. N. Rangaswami Ayyangar who succeeded Mr. R. C. Broadfoot as our President and evinced great interest in the affairs of the Union.

Owing to the unexpected conditions prevailing in this province due to the world war, the Managing Committee regret that they could not arrange for the usual College Day and Conference in July 1942. We hope that ere long the situation would improve to enable the celebration of the College Day at least in 1943.

SELECTED ARTICLE

Recent Advances in Control of Fungous Diseases of Plants.

By G. WATTS PADWICK.

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At the present time, when it is necessary to promote in every possible way the increase of agricultural production, and when the output of fundamental work has been substantially reduced, it is appropriate to consider a few of the directions in which advances have been made during the last very productive decade. This period has been by far the most productive, judged by volume, of all the history of plant pathology. In some quite new directions studies have been made and have resulted in useful knowledge, but in most cases the information which has lent itself readily to practical applications has been due to the reinvestigation of old fields which for some time have not received much attention. As very good examples of this we may quote the excellent work which has been done on such widely different subjects as plant hygiene, fungicides and nutrition in relation to disease.

Hygiene. By plant hygiene we refer to those steps which are taken to ensure that the diseased parts of plants are removed and destroyed or in some way rendered harmless to healthy crops. Some very valuable work of this sort has been done on the root rot disease of rubber in Malaya, caused by *Fomes lignosus* Kletzsch and *Ganoderma pseudoferreum* (Wakef.) Van O. et Bt. This fungus produces long creeping strands of tough resistant hyphae, which spread from diseased jungle stumps to the healthy rubber trees. It has been found that by removing completely the diseased stumps the spread of the fungus can be stopped. Another most valuable hygienic method, involving the use of chemicals, is now widely adopted in Europe and America for controlling the late blight disease of potatoes The fungus, *Phytophthora infestans* de By., attacks first the leaves of the plants and from the rotten leaves passes down to the tubers The fungus is however, a highly developed parasite which makes little growth in the soil, and consequently if the leaves are destroyed before the spores have had time to form in sufficient quantities, the tubers are not likely to become badly infected. To accomplish this when an epidemic seems about to set in plants are now sprayed with 5 per cent copper sulphate or 12½ per cent sulphuric acid solution, completely destroying the foliage. Of course this cannot be done in an immature crop without reducing the yield, and the stage of development at which it can be safely done has to be scientifically worked out for the condition under which the crop is being grown. An example of hygiene for the control of a disease in India is to be found in the gram blight disease caused by *Mycosphaerella rabiei* Kovachevsky. Here the clearing up and burning of all diseased tissues prevents the spread of the disease, but unfortunately it has not proved possible to get all cultivators in a district to carry out the work simultaneously, and consequently another method of control has had to be evolved.

Soil conditions and plant disease. The physical and nutrient condition of the soil have long been considered important factors in the development of disease. These factors received particular attention at the end of the last century, and led to the formation of a school of plant pathologists known as the 'Predispositionists'. Outstanding among the names were those of Paul Sorauer and Henry Marshall Ward. There was a lack of agreement among the investigators, and it

was perhaps due to the tendency to generalize when drawing conclusions based on observation or experiment. One of the outstanding findings from recent work has been that it is possible to draw from a single experiment conclusions which can be of general application. By restricting the conclusions in their interpretation to the particular diseases on which the results were obtained, information of direct practical application has resulted. A few examples may be quoted

It was a matter of common observation that most of the soil borne diseases of annual crops are intensified by frequent growth of one kind of crop on the same soil. This is very noticeable in the cereal crops which suffer heavy losses from foot- and root-rots carried in the soil. However, this is not always the case, and some soils become (sick) less quickly than others. There are also instances, as for example the *Pythium* disease of wheat where disease is worse after a bare fallow than after a previous wheat crop The different behaviour exhibited by different crops is due to the action of several factors. The soil condition may influence either the host or the parasite. Thus in the case of most of the root rot diseases of cereals the effect of soil conditions seems to be on the parasite, and any condition which favours the growth of the parasite favours also the development of the host. One of these conditions is continuous growth of the host which thus supplies over a long period of time conditions favourable for the fungus out of all proportion to the general level of soil microbiological activity. It has been shown that in the case of the *Pythium* disease of wheat the fungus is less susceptible to the harmful effects of other fungi which grow in great abundance in fallow soil, but on the other hand it is particularly responsive to the composition of the host plant. The disease does not operate severely in plants with a high phosphorus-nitrogen ratio which is found in frequently cropped soils. Subsequently it has been found that the disease can be controlled by a proper system of manuring with phosphates A similar state of affairs exists in the *Pythium* root-rot of sugarcane in Hawaii.

A good deal is now known about the effect of physical conditions in the soil in relationship to the development of disease The temperature most favouring the development of a number of diseases is known For example, the wilt disease of plants caused by species of *Fusarium* are severest at rather high temperatures. Wilt of cotton occurs with great severity when the temperature of the soil is about 28°C and with a soil moisture of 60 per cent of the water-holding capacity The smut diseases of the common cereals occur at lower temperatures about 10° for common bunt, 10° to 20° for oat smut, and so on. Often it has been found that this optimal temperature is the same as that for the vegetative growth of the fungus, independently of the optimal temperature for growth of the host This rather rules out the popular idea that a plant grown at the ideal temperature is necessarily more resistant to disease. It also opens up a new field, namely the sowing of seed at the time least favourable for disease to develop An example can be found in the cotton crop in the Punjab, which suffers severe root rot if sown in the month of May but not if sown by the first week of April or towards the end of June. A common drawback in such a method is that the abnormal date of sowing has sometimes an adverse effect on yield A similar effect can be brought about by growing the cotton crop intermixed with another crop such as *moth* (*Phaseolus aconitifolius*) which lowers the soil temperature. The extraordinarily beneficial effects of this method of control of cotton root-rot have to be seen to be believed.

There are however, some cases in which the optimum for the disease is far lower than the optimum for the growth of the fungi in pure culture. It has been shown that this is because at lower temperatures certain fungi are much

less susceptible than at higher temperatures to competition by other soil micro-organisms

Resistant varieties One of the first methods of obtaining resistant varieties was by increasing the progeny of isolated individuals which appeared healthy in fields in which most of the plants were heavily infected. It was tried with many crops and was sometimes successful but more often was a failure. The chief reason for the failures was that the plants which had all the appearance of being healthy were actually infected, but at a late stage or under such conditions that they did not succumb to the disease. This meant that the progeny grown were more often than not from parents that were not at all resistant, and the intentions of the plant selector were thwarted. It was possible to overcome this only when methods were found for guaranteeing heavy infection in a susceptible variety. This is one of the palces where fundamental research has played such a valuable part. By knowing the temperatures, humidities, soil conditions, etc. at which the fungi grow best and the disease develops most rapidly, it has become possible so to adjust conditions that heavy infection is certain provided the variety of the plant is a susceptible one. In this way very useful work is now being done in India as elsewhere in the breeding or selecting of resistant varieties of cereals to the rusts and smuts, of cotton and *arhar* to wilt, sugarcane to redrot, smut and mosaic, of potatoes to early and late blight and so on.

At the start there were many failures. Varieties which appeared to be highly resistant were found to break down with the passage of time or when the crop was grown in a new locality. One of the chief reasons for this was the fact that the fungi themselves exist in many physiologic forms, that is to say, races which were alike in appearance but attack quite different groups of varieties of hosts In recent years it has been realised that this is not a characteristic restricted to a few fungi, but is found in all the groups. That is not the end of the story. It is now known that by hybridization and by sudden inherited changes known as 'mutations' new physiologic forms of fungi with new ranges of hosts are constantly arising. It has even been shown, in the case of *Phytophthora infestans* de Bary, the cause of 'late blight' of potatoes, that such changes in the nature of a fungus may be brought about by growing it on a series of hosts, starting with susceptible ones and gradually working through the more and more resistant varieties until the fungus will eventually severely attack those which were previously considered to be immune. Such a state of affairs would be very discouraging, and few workers would care to try to secure resistant varieties were it not for the fact that the very existence of sharp differences in the behaviour of the different physiologic forms of the fungi on different groups of hosts indicates correspondingly sharp differences on the part of the hosts, and use can be made of the plant breeder's skill to unite in one plant the different types of resistance exhibited by a number of different parents The establishment of a series of 'differential hosts' for recognizing the different physiologic forms is now a recognised routine with the plant pathologist. Breeding and selecting for resistance to disease is one of the most popular fields of endeavour of plant pathologists in India. Following are a few of the diseases for which Indian workers are breeding or selecting resistant varieties.

Crop.	*Disease.*
Wheat.	Stem rust (*Puccinia graminis* Pers) Yellow rust (*Puccinia glumarum* (Schm) Erikss. et Henn) Brown smut (*Urocystis Tritici* Erikss) Flag smut (*Urocystis Tritici* Koern) Loose smut (*Ustilago Tritici* (Pers.) Jens.)
Barley.	Smut (*Ustilago Hordei* (Pers) Legerheim)
Oats.	Smut (*Ustilago Kolleri* Wille)

Paddy.	Leaf spot (*Piricularia Oryzae* Cavara)
Cotton.	Wilt (*Fusarium vasinfectum* Atk.) Root-rot (*Macrophomina Phaseoli* (Maubl) Ashby.)
Pigeon-peas.	Wilt (*Fusarium udum* Butler)
Sann-hemp.	Wilt (*Fusarium udum* Butler var Crotalariae (Kulkarni) Padwick)
Gram.	Wilt (*Fusarium orthoceras* App et Woll. var. *Ciceri* Padwick) Foot-rot (*Oberculella Padwickki* Kheswalla). Blight (*Mycosphaerella rabiei* Kovachevsky)
Potatoes.	Late blight (*Phytophthora infestans* de Bary) Early blight (*Alternaria Solani* (Ell. et Mart.) Jones et Gr.)
Sugarcane.	Red-rot (*Colletotrichum falcatum* Went). Smut (*Ustilago scitaminea* Sydow) Wilt (*Cephalosporium Sacchari* Butler).

Fungicides. The sprays used as fungicides have undergone little change in recent years. Little really new has been found, and the improvements have been chiefly in the direction of manufacture This has been partly due to our greater knowledge of colloids A number of proprietory copper and sulphur colloidal sprays are now available which have only to be diluted with water to be ready for use. They are naturally convenient and have proved popular among small growers who have not the skill or the materials necessary to do their own preparation. Really new materials for spraying have been few. There have been however, marked improvements in spreaders used, and good proprietory compounds are now on the market,

An important development has been the tendency to replace the use of sprays by dusts. Cupric and cuprous oxides have particularly come to the fore This development has been due in a considerable measure to commercial interests, but the extent to which they are capturing the market in various parts of the world and are being put to a wide range of uses is a clear indication that their effectiveness is of a high order.

In the seed dressings there have been three distinct lines of development. The first of these is in the replacement of wet dressings by dusts. Immersion in a solution of copper sulphate has practically gone out of use and even formalin solution has dropped in popularity in western countries, though still in favour in India. Immersion in solutions of organic mercury compounds came into vogue in the early twenties, to be followed shortly by dusts consisting of small quantities of the active substance mixed with talc or some other inert substance. Among the favourites were the chlorides, hydroxides and nitrates of the paraffin series Generally speaking the more volatile compounds were the most effective as seed dressings Now it has been found that the phosphates of these compounds are particularly potent fungicides The switch over to these better mercurials and the treatment of seed with them on a big scale marks a distinct advance in the control of seedborne diseases. The third development, and in some ways the most interesting, is the production of a non-mercurial seed dressing of sufficient merit to become a competitor of the mercurials This is a compound produced by Imperial Chemical Industries Ltd., in England, and known as Nomersan having tetramethyl-thiuram-dissulphide as the active constituent. It has proved so effective a seed dressing that the whole of the flax crop in Ireland has been treated with it to prevent seedling blight. The compound is non-poisonous to animals in any quantities in which it is ever likely to be consumed, and it therefore seems as if it might spread in countries where poisonous substances are disliked.

Need for continued research. The few instances of recent advance which have been quoted are not intended to give a full picture of the research which is

going on To do so would take volumes. They are merely intended to indicate a few of the many directions in which considerable advances have been made. The refinements of research technique in recent years have been notable but there is still room for improvement and for the wider adoption of better methods. Furthermore, the advance of other sciences brings new problems When the plant breeder produces new varieties with a combination of good commercial characters, they are often susceptible to diseases. When a variety is introduced which is resistant, it sometimes happens that the fungus population changes so as to give rise to a form, perhaps previously existent only in small numbers, but now the predominating type, which can play a havoc with the new host in a quite unexpected way. Again, the growing tendency to specialization in agriculture involves soil conditions which may be favourable to the growth of fungi, or may make the hosts unusually susceptible to infection. The proper use of fungicides can only be made if they are tested under the conditions in which they are intended to be used. There is in fact no end to research in sight for the plant pathologist. (*Indian Farming* Vol. 3, No. 9 September 1942).

ABSTRACT

Toxic effects of sodium pentachlorphenate and other chemicals on water hyacinth. A. A. Hirsch. *Bot Gaz.* 103 : (1942) 620. Preliminary experiments were carried out on the eradication of water hyacinth by treating it with two recently introduced chemicals: sodium pentachlorphenate, an industrial algaecide and fungicide marketed as Santobrite by the Monsanto Chemical Company of St. Louis, Missouri, and Beneclor 3, achlorinated hydrocarbon manufactured by the Chloroben Corporation, Jersey City, New Jersey. Although some damage was inflicted by beneclor 3, its toxicity was insufficient to be of much use. In the case of santobrite even the initial dose caused yellowing of stalks and withering of leaves. Thirty five parts per million seemed to arrest growth and complete necrosis was obtainable with a concentration of 80 parts per million.

The physiological action of santobrite suggests two field procedures for combating the problem of water hyacinth: (1) A light application, somewhat more than 5 parts per million, for retarding growth in areas where complete removal is not essential or in zones where the aquatic life is to be preserved. (2) complete elimination by a dosage approximating 80 parts per million.

M. M. K. M.

EXTRACTS

Synthetic plant hormones. New synthetic growth-promoting substances, or plant hormones, many times more powerful than those now in use experimentally and by greenhouse men, have been prepared at the Boyce Thompson Institute for Plant Research, Yonkers, N. Y., by Dr. P. W. Zimmerman and Dr. A. E. Hitchcock. Applied to plants in the form of vapour, spray, emulsion, lanolin paste, or added to the soil, they induce profound changes in growth, and they can also induce the formation of seedless fruits from unpollinated flowers at points on the stem a foot or more from the place of application. Treated plants are so changed that sometimes they look like different species. The new hormones are prepared from various milk organic acids, which have no effect on plants in their ordinary state, by the addition of atom-groups containing chlorine, iodine or bromine, either singly or in combination. One very effective compound of this sort is known as dichlorophenoxyacetic acid. It has been found to be fully 300 times more effective in producing plant changes than indolebutyric acid, one of the synthetic plant hormones now widely used. Solutions as weak as 10 to 25 parts (by weight) in a million parts of water have been

found most effective. In all, eleven different compounds of the new class have been prepared. All seem to share the same great power over the growth and development processes of plants, and all seem to depend on the addition of one or more of the chlorine–iodine–bromine trio of elements (halogens, the chemists call them) to a weak organic acid foundation. Drs Zimmerman and Hitchcock warn against rushing into attempts at practical application without further experimentation: "Considering the activity of these new growth modifying hormones and their capacity to cause extreme types of distortion, caution should be exercised in their practical application. In view of the tendency to include various types of hormones in fertilizers, fungicides, insecticides and other commercial preparations the use of these new compounds should be preceded by extensive experimentation to make sure that they will not be detrimental to crops. Phenoxyl compounds are known to have insecticidal value and now that they are also known to be plant hormones there might be a tendency to incorporate them in commercial sprays and fertilizers. The idea would be good, but the results might be disastrous". (*Science*, N S. 95 (1942), 12)

Homogenised milk. When a bottle of milk is allowed to stand for some time, the cream layer separates at the top This is due to the rising of the fat globules slowly through the bulk of the liquid The effect therefore renders the milk rich at the top which pours off in the first cup, leaving less nutrition for others. This creamy richness contains most of the vitamins A, D and E which are fat soluble and hence remain in the fat globule The idea of homogenizing milk struck the French technologist, Gualin some forty years ago. The same method is now employed only with perfected machineries. The fat gloubles are ordinarily less than 1/100 mm. in diameter but they coalesce and grow in size to rise up and form the cream line. The idea of Gualin's method of homogenizing milk is to break up the globules into size of about 1/500 mm. This would prevent the rising and separation of cream layer. The breaking up of the tiny fat globules are accomplished by forcing the milk through fine slit-like jets under pressures of about 2,500 pounds per square inch against a polished concave surface of metal. The fat globules, shattered into finer fragments make the milk homogeneous in fat and vitamin contents throughout the bulk. This makes the milk more palatable too. It is also possible to homogenise milk by setting up ultra sonic waves through them. These ultra high frequency ripples are equally effective in fragmenting the fat globules. It has also been found that properly homogenised milk produces soft and flacky curd in the stomach so that it is more easily digested. (*Science and Culture*, 8, 1942, 125.)

Utilisation of lignin waste. Modern Industrial chemistry has more than once demonstrated how a country's greatest waste often becomes the richest source of valuable materials for everyday use. This has once more come to pass in the case of lignin, the *darm*, resinous substance which until recently was regarded as a waste by-product of the paper industry Lignin, as is well known, is present in the cellulose-walled cell of all plants making them woody and constitutes as much as 25 per cent of the coniferous trees the chief starting material of paper. Making of good sulphite paper necessitates its removal from the pulp and as the chemist could not for a long time effect any utilisation of this product there was no other alternative but to allow it to run to waste From the beginning of the present century the colossal waste of lignin engaged the serious attention of chemists who, after 60 years of research have succeeded in making a partial utilisation of this by-product The utilisation is yet insignificant inasmuch as not even ·05 per cent of the 3 million tons of ligoin available annually from U. S. and Canada can be converted into useful derivatives. As a matter of fact, in the paper mills of United States alone 12 million gallons of lignin waste are

drained everyday. Despite the present meagre utilisaion lignin waste, as researches indicate, bids fair to produce important derivatives and form the basis of great chemical industries. Already the Marathon Paper Mills of Rothschild has attained a great measure of success in producing a number of important derivatives from calcium lignin sulphonate precipitated from waste liquors by the addition of lime. Of the various derivatives mention may be made of vanillin, tanning chemicals, water softening agents, lignin plastics and road-binding material. One half of the vanillin required in United States was produced from lignin last year. Tanning chemicals synthesised from lignin have proved more efficient than tanbarks Lignin plastics, the most important of all derivatives, can be used for making table tops, refrigerator and airplane doors, parts for ships, tanks, planes, bomb fuses and cases for shipping shells. The laminated form of lignin plastic which is one fifth the weight of steel has the same strength of steel weight for weight Furthermore the product is cheaper and requires less phenol (2 or 3 per cent). It is expected that the utilisation of lignin will increase the production of U. S plastics, now reckoned as important raw materials, to double the present amount. In places like New Jersey and Washington road-binding material prepared from lignin has successfully replaced tar. Chemists are of opinion that in the near future lignin waste is destined to play a great role like coal tar in the chemical industries of a country. (*Science and Agriculture*, 8, (1942) 126).

Synthetic fuel. A report published in a recent issue of the *Chemical Age* reveals that the French have almost succeeded in developing a method of manufacturing synthetic coal from leaves For some time past shortage of fuel was being experienced in France, which instigated research in the direction of perfecting a method of synthesising coal from organic matter. This new synthetic coal has been termed Carbofeuille The experiments reveal that about 1 cwt. of fuel can be obtained from the leaves of an average tree. It has been estimated that all the trees of Paris, totalling over 89,000 would produce 4450 tons of fuel. Owing to the heavy cost of collection and transport, utilisation of the trees in a big city like Paris will be hardly economical. The scheme, however, bids fair to produce fuel economically if the method be carried on in or near a forest like the Bois de boulogne. Manufacture of synthetic coal on a commercial basis has not yet been attempted. But as it appears from the report the Vichy Government is very keen about making this method a national asset to solve the fuel problem. The method may be briefly stated as follows: The leaves are collected and carbonised. In the process they give rise to a gas, pyroligneous acid and a tar, of which the gas after mixing with coal gas is utilised in carbonising other leaves. The carbon so formed is finely crushed, to which water and coal tar are added. The mass is then pressed into the shape of nuts and left to dry for a few days, when it is ready for use as a fuel. The heat of combustion of this new synthetic fuel is estimated at 4800 calories. The consumption of coal tar and coal gas in the process is very small. For instance 70 lb. of tar can produce one ton of the nuts. Further by increasing the size of the plant the amount of coal gas required can be reduced proportionately. (*Science and Culture*, 8, (1942) 126).

Gleanings.

Agricultural colony of the educated unemployed. The establishment of an agricultural colony with settlers drawn from the educated unemployed in Mysore State is contemplated in a scheme sanctioned by the Government of Mysore on the recommendation of the Director of Agriculture in Mysore. According to the scheme 20 candidates are proposed to be selected as colonists, each being given

culturable land and an advance of Rs. 1000 for necessary equipment and cultivation expenses under certain conditions. A committee of officials and non-officials has been constituted for the management and supervision of this colony which will be established under the Marconahalli Reservoir. (*Indian Co-operative Review* Vol. 8, No. 2 of 1942).

Storage of apples for a long time. Apples breathe oxygen and exhale carbondioxide in much the same way as human beings and their respiration eventually burns up the fruit sugar content Slowing up this respiration process by the usual cold storage methods preserves the apples but not long enough to keep tham marketable through out the year from one picking to the next. Through experimentation English scientists found that when apples were kept in a sealed chamber in which the oxygen content was allowed to drop from the normal 21 percent to two percent and the carbondioxide was allowed to build up to five percent, some types of fruits would last three times as long as under regular storage conditions. To insure the correct combination of gases at all times, a technician takes samples of air from storage chambers at regular intervals. If the carbondioxide content is too high, the atmosphere is washed to reduce it. (*Popular Science*, July 42).

Correspondence.

To The Editor, Madras Agricultural Journal.

Wealth from waste. Another use for *Thevetia nerrifolia* Juss (Family-Apocynaceae), English: The Exile or Yellow Oleander, Tamil: *Ponnarali*, Telugu: *Paccha gannern*—oil for illumination.

Sir,

Thevetia nerrifolia Juss, an introduced South American plant is now almost naturalised in India. There is scarcely a place in the plains of India without a few bushes, if not a hedge of this plant. In fact it is the most hardy, quick growing, evergreen, easily cultivated and therefore the most popular of all live hedges. The plant has seeds which have cent percent germination. The seeds are never attacked by insects or fungi Once the seeds establish, the plants grow splendidly well and quickly too.

The plant is a laticiferous erect bush when pruned so as to allow it to branch profusely, or a small tree with closely set simple alternate, linear, exstipulate glossy leaves. Flowers are borne in large cymose clusters; they are golden yellow, attractive, bell shaped and fragrant. They are gathered by the Hindus for puja purposes. The fruit is a rounded somewhat angular drupe with usually one and rarely two seeds. The seed is exendospermous and the cotyledons are very rich in oil—as much as 66%. As the oil oozes out even with a little crushing with the hand, it must be of easy extraction when wanted in large quantities.

The oil is almost colourless and burns very steadily, maintaining an erect flame with practically no smoke The oil was placed in a shallow glass vessel and a cotton wick was used for burning. An ounce of the oil burnt for nearly three hours. In days of kerosine scarcity the villagers can collect the seed which are produced in large quantities in each tree and can make use of this oil for burning lamps of the old (Tamil: *kuththu Vilakku*) Indian type It is of course for people of the technological department to find out a suitable lamp where this oil will find its use. It is now understood a lamp has been devised for burning groundnut oil. Similarly another type of lamp may be devised for employing this oil. "Necessity is the mother of invention". In the case of *Thevetia nerrifolia* Juss, the fruits are now going to waste and no use is made of

them as they are poisonous At a time when we are trying to discover the economic uses a number of our indigenous and acclimatized plants, the uses to which *Thevetia* could be put should not be lost sight of. Everyone knows it is a good hedge plant and recently Messrs. M. C. Cherian and S. Ramachandran of the Entomological Section, Agricultural Department, Madras, have been able to prepare a vegetable insecticide from the kernel. The employment of the oil for burning will be a third use and it is possible the oil cake may prove a good manure.

Agricultural College and Research Institute, Lawley Road P. O., Coimbatore. } S. N. Chandrasekhara Ayyar, Lecturer in Botany.

Derris Elliptica Benth.

Sir,

Mr Cherian Jacob evidently meant when he wrote the note on "Derris" in September issue of the Madras Agricultural Journal (Page 321) to focus attention on the possibility of cultivation of such a valuable plant as 'Derris' in parts of South India. But unfortunately it conveys a different impression also. Coming as it does from an officer of the Agricultural Department the reader will be tempted to ask why the Agricultural Department had not so far taken steps to propagate this material. It is better such a wrong impression is corrected here and now.

It may be of interest to know that as one interested in insecticides I had taken up the question of propagating the Malayan 'Derris' as early as 1936. Rooted cuttings were obtained from Bangalore through the courtesy of the State Entomologist and planted out at the Insectary attached to the Research Institute. They established well and put up a very good growth. What is more the dusts prepared from the fine roots of these locally grown plants compared very favourably with Derris insecticides imported from abroad in several of the insecticidal tests against crop pests. It is thus possible to raise 'Derris' in Coimbatore successfully. It is also proposed to test their suitability for cultivation in different parts of the Presidency and there is a programme on hand to supply rooted cuttings to different Research Stations for testing in the coming season.

Agricultural Research Institute, Lawley Road P. O., Coimbatore. } M. C. Cherian, Government Entomologist.

Weeding.

Sir,

Weeding is an operation usually done to almost every crop after it has come up to a certain stage This operation should never be neglected and the far reaching effect of this is embodied in the saying "one years seeding is seven years weeding". The best period to remove the weeds is therefore before they set seed. The usual practice is to weed the field and in nine cases out of ten, where the weeds are not suitable for forage, they are thrown on the bunds. It is either left to rot there or removed at some other convenient time. In the case of succulent weeds like Trianthema, *Soranai* Sp they do not die for a number of days and even set seeds after removal from the field. During this interval enough seeds fall to the ground to ensure a good sprout after the next shower. These in their turn infect the field, as the varied adaptations for seed dispersal set to work, thus defeating the purpose of weeding. Where the slope of the field is pronounced rain water carries quite a lot of seeds to the lower bunds where it germinates and flourishes in a sort of ideal seed bed formed by the finer soil particles washed down. Bunds therefore have to be weeded as systematically as the field. This does not imply that every bit of grass etc. should be removed from the bunds. Bunds must have vegetation to hold the soil in place, but care

must be taken that they are of the correct type. Further, grasses like Haviali must be prevented from spreading into the field by trimming the bunds and sometimes digging the field close to the bunds.

Shrubs like Abutilon indicum, Calatropis gigantea, etc, get established on the bunds sometimes. In an effort to clean up the area they are usually cut back to the ground level. This never destroys the plant, which shoots up vigourously in a few days. Frequent cutting back to the ground level only serves to thicken the stem, making eradication difficult and costly later. Such shrubs should be rooted out by the cotton stalk puller. The best time for such an operation is a day or two after a heavy rainfall. On such days field conditions may not allow of any tillage operations and apart from engaging the regular coolies, makes the work easier and more complete, in as much as the roots and stem do not get broken In cases where the above mentioned implement cannot be used recourse must be had to the crow bar and mamotty.

T. K. Mukundan,
Agricultural College, Coimbatore. Farm Manager, Central Farm.

Press Notes.

A Few Tips for Mango Growers.*

Q. This large mango plantation of mine is nothing more than a luxury. I have maintained it too long to be satisfied with it. What to do with my unthrifty trees is the problem that is continuously worrying me.

A. Luxuriant foliage has often been the bane of mango growers. As a practical grower you are mainly interested in getting a good harvest. You have therefore to judge your trees from only one standard—namely whether they respond to your care by yielding large quantities of fruits. It is certainly true that to produce a good load of crop the trees must grow well and must be tended properly. But there is a limit beyond which feeding may aptly be termed as overfeeding. Excess of growth limits fruit production. Very fertile soils heavy and frequent irrigation and heavy manurial applications all tend to make the trees run to leaf at the expense of fruit-bearing. You have to distinguish between healthy normal growth and luxuriant growth. One is as much desirable as the other is a curse.

Q. I see now that all what I have been doing in my enthusiasm is but a waste. I still fail to see how a few of my trees are yielding fairly heavy crops, while most of them are giving me only a few fruits and some not even producing a single fruit.

A. This differential behaviour in the performance of your trees is easily explained. I see that most of these poor yielding trees are of varieties that have characteristically shy-bearing tendencies Those trees that you have there seem to be the reputed *Jehangir* mango of the Circars. Those next to them seem to be *Mulgovas*. Both these are among the shy-bearing varieties, which do not merit a place in commercial orchards. On the other hand I note that most of your heavy yielding trees are of *Neelum* and *Totapuri*. These usually produce heavy crops under almost all conditions, although they are by far inferior in quality to *Jehangir*. If you wish to harvest regularly heavy crops, you have to plant only such varieties as are naturally heavy yielders. A superior mango like *Jehangir*, *Himayudin* or *Mulgova* has its place in a home or bungalow garden, but certainly not in a large scale orchard.

* Extracts from a Radio talk from the A. I. R. Madras and Trichinopoly on 21st and 13th October respectively.

Q. Is it too late now to mend matters?

A. Not exactly. Unfruitful trees can be converted into profitable ones by top-working. Description of one of these methods is reserved for a separate talk. A separate leaflet on this method is also being published by the Department of Agriculture for the benefit of ryots. The other and simplest method is to remove your useless trees and plant profitable varieties instead. But this simple method is not always as good. For one thing, a new tree will not grow well in the place previously occupied for years by another.

Q I am not in favour of cutting down my trees. Can you advise me what varieties to plant for commercial purposes? I wish to raise a new mango plantation and I am not keen to repeat my mistakes.

A. This is a question which no prospective grower should fail to ask. We have over 400 varieties of mangoes in this province, and most of these are naturally unsuitable for commercial cultivation. Accurate sketches and descriptions of our choicest table juicy and commercial varieties are given along with other useful information in the Agricultural Department Bulletin No. 24 on "South Indian Mangoes". I advise you to purchase a copy of this, which costs only Rs. 0—2—0 from any of the depots of Agricultural Demonstrators.

Q. Thanks for the information. But there is still one doubt in me. You say that certain varieties are more productive than others. But how do you account for the fact that some trees of a variety fail to yield well, while others of the same variety give good crops? I have some *Alphonso* plants got from three or four different nurseries Trees got from one nursery have regularly failed to give me any crop.

A. This brings me to the other important precaution which every prospective grower should observe. It is not enough if you purchase trees of productive varieties, but you have also to see that the grafts of such a variety have been raised from selected high-yielding parent trees. If you fail to select the best parent trees it is possible that the value of your selection of varieties will be totally nullified You should patronise only such nurserymen, who take pains to mark out their best yielding trees for propagation. Trees raised from poor parents may be a permanent recurring liability to you. Parental influence is of supreme importance in several fruits. It is not known that the failure of most orchards is due to the fact that the trees planted in these orchards are those, which have been propagated from inherently poor-yielding, inferior or barren trees.

Mofussil News and Notes.

Bobbili: Food production Week. A "*Food production week*" was celebrated in the Bobbili Taluk from 25—10—42 to 30—10—42 The Bobbili Sugarcane growers' Co-operative Society took the initiative in conducting the celebrations. Two big processions were taken round in Bobbili town, one on the 25th and the other on the 30th with several placards and posters impressively displayed. The students of the local High School and the Elementary Schools, who partook in the processions sang agricultural songs and slogans on "Grow more food" "Grow vegetables in back yards" and "Use hand-pounded rice" etc. The celebrations were also done in three important villages of the taluk with processions in a similar manner. The Agricultural Demonstrator, Bobbili, addressed several public meetings during the week, besides arranging for lectures by other gentlemen and by the Agricultural Demonstrator on special duty, Bobbili. A novel feature of the celebrations was the giving of lectures on, "Grow more

food" during the course of the procession in each street by the Agricultural Demonstrator Bobbili. The celebrations were a splendid success. A. S.

West Godavari District. *Grow more food Week.* After due, prior consultation with the District Agricultural Officer, the Collector West Godavari district, decided to celebrate the "Grow more food week" in all taluks from 24th to 29th October 1942. A comprehensive exhibition illustrating improved methods of food production with the aid of charts, posters and samples was on show at the Agricultural Depot in all taluk head-quarters. The week was commenced on the 24th October '42 at all taluk head-quarters with a procession in the morning of interested *ryots*, school children and teachers shouting and singing "Grow more food" slogans specially composed for the occasion. Local drummers and pipers provided the necessary musical accompaniments to the procession until it reached the Agricultural Depot. The Agricultural Officer in charge explained to the visitors the instructive exhibits in the show. In the after-noon there was a public meeting at which lectures on "Grow more food" were delivered by the Agricultural Demonstrator and others. Similar celebrations were held on the succeeding four days at four selected village centres in each taluk.

On the 29th the concluding celebration at each taluk head-quarters consisted in a conference of *ryots* and rural workers when the activities of the Week were reviewed and plans of work fixed up for the ensuing cropping season. The "Grow more food week" was brought to a close on 30—10—1942 with an all-day celebration at the district head quarters (Ellore) at the District Agricultural Office grounds. A very instructive "Grow more food" exhibition was arranged that morning in the hall of the District Agricultural Office. The District Agricultural Officer in a brief speech welcomed the assembled guests and visitors and requested the Collector to open the exhibition. After the exhibition was declared open the District Agricultural Officer took round the Collector and the assembled visitors and explained to them all about the various improved strains of cultivated food-crops, green-manures, oil cakes, vegetable seeds, etc. on show. Planting of mango, orange and sapota graft plants was done by the Collector in the District Agricultural Office compound. In the after-noon, there was a public meeting over which the Collector, Rao Sahib P. S. Kajamayya, presided. In his speech the Collector stressed the need for growing more food crops in order to ensure victory and provide adequate food supply both for the combatant soldiers and non-combatant citizens. The District Agricultural Officer addressed the *ryots* on the methods which they should adopt for increasing the out-put of food crops and detailed to them all the various concessions granted by the Government to induce them to grow more food. The Deputy Registrar of Co-operative Societies and several others also spoke. K. V.

Taliparamba district work officers conference. The half yearly conference of the district work officers, conference of Malabar and South Kanara was held at the Agricultural Research Station, Taliparamba, from 7th to 11th September 1942, under the presidency of Sri U. Vittal Rau, District Agricultural Officer, Mangalore. Sri A. Gopalan Nair, District Agricultural Officer, Calicut, contributed to a great extent in the discussion of the subjects and guidance to the staff. Besides Agricultural Demonstrators from Malabar and South Kanara, the Assistant Agricultural Demonstrator in Mycology cum Entomology, the Sub-Assistant employed for 'Budrot of palmyra' and the Farm Managers attended the conference. First three mornings were occupied with visit to the farm and the visitors acquainted themselves with the work so far done on the farm and the work in progress. The varietal collection of pepper, experimental plot of standards, chilly varietal and cultural experiments and the nursery section attracted the attention of the visitors. On the 10th an excursion was arranged

for studying at first hand the local practice of sugarcane cultivation at Kurumathur and the dryland farming in the neighbourhood.

The conference discussed interesting subjects such as standardising of annual reports and district work register; programme of work and progress so far achieved; how to run seed farms; work to be undertaken in non-central villages and ways and means of growing more food crops as war measure, etc.

A. G. N.

Crop and Trade Reports.

Statistics—Paddy—1942-43—First report. The average area under paddy in the Madras Province during the five years ending 1940-41 represents 13·3 per cent of the total area under paddy in India. The area sown with paddy up to the 25th September 1942 is estimated at 6,179,000 acres. When compared with the area of 5,809,000 acres estimated for the corresponding period of last year, it reveals an increase of 6·4 per cent. The increase in area is general outside the districts of Guntur, Coimbatore, Trichinopoly and the South (except Tanjore) where there is a decrease in area. The increase in area is generally attributed to the "grow more food" campaign. The increase is marked in Chinglepet (+85,000 acres) and East Godavari (+75,000 acres). The estimated area under paddy is the highest reported in recent years in Chinglepet (410,000 acres) and Tanjore (803,000 acres).

The first crop of paddy is being harvested in parts of the districts of Chinglepet, South Arcot, North Arcot, Salem, Coimbatore, Tanjore, Tinnevelly, Malabar and South Kanara The yield per acre is expected to be above normal in South Kanara, slightly below normal in North Arcot and normal elsewhere. The condition of the standing crop is satisfactory outside Vizagapatam, Guntur (dry paddy), Trichinopoly and Ramnad (dry paddy) where the crop suffered from drought to some extent.

The wholesale price of paddy, second sort, per imperial maund of 82⅔ lbs. as reported from important markets on the 5th October 1942 was Rs. 5—11—0 in Trichinopoly and Madura, Rs. 5—9—0 in Vellore and Tinnevelly, Rs. 5—3—0 in Chittoor, Rs 4—11—0 in Rajamundry, Rs. 4—10—0 in Kumbakonam, Rs. 4—9—0 in Cocanada Ellore and Hindupur, Rs. 4—8 -0 in Vizianagaram, Rs. 4—6—0 in Bezwada, Rs. 4—5—0 in Cuddalore, Rs. 4—4—0 in Negapatam, Rs. 4·-3—0 in Mangalore and Rs. 3—15—0 in Anantapur. When compared with the prices published in the last report, i e, those which prevailed on the 9th February 1942, the prices reveal a rise of approximately 90 per cent in Madura, 82 per cent in Vellore, 79 per cent in Trichinopoly, 64 per cent in Cuddalore, 57 per cent in Kumbakonam and Chittoor, 55 per cent in Nagapatam, 51 per cent in Tinnevelly, 50 per cent in Hindupur, 35 per cent in Cocanada, 34 per cent in Rajamundry 30 per cent in Ellore, 29 per cent in Mangalore, 26 per cent in Anantapur, 24 per cent in Vizianagaram and 23 per cent in Bezwada.

Sugarcane—1942—Second report. The average area under sugarcane in the Madras Province during the five years ending 1940-41 represents 3·0 per cent of the total area under sugarcane in India. The area planted with sugarcane up to the 25th September 1942 is estimated at 116,390 acres. When compared with the area of 104,990 acres estimated for the corresponding period of the previous year, it reveals an increase of 10·9 per cent. The estimated area is the same as that of last year in Vizagapatam and Tinnevelly; a slight decrease in area is revealed in West Godavari, Guntur, Kurnool, Anantapur and Chinglepet and the area has increased in the other districts, especially in Kistna (+1,000 acres) Chittoor (+1,000 acres), Salem (+2,500 acres), Coimbatore (+1,100 acres) and

Trichinopoly (+3,100 acres). The increase in area is due mainly to the high price of jaggery, at the time of planting.

The condition of the crop is fairly satisfactory. The seasonal factor for the Province as a whole works out to 97 per cent as against 96 per cent for the corresponding period of last year. The total yield for the Province in terms of jaggery is accordingly estimated at 343 110 tons as against 305 450 tons for the corresponding period of last year representing an increase of 12 3 per cent.

The wholesale price of jaggery per imperial maund of 82⅔ lbs as reported from important markets on the 13th October 1942 was Rs. 14—6—0 in Vellore and Chittoor, Rs. 14—4—0 in Cuddalore, Rs 13—3—0 in Adoni, Rs. 12—8—0 in Salem and Mangalore, Rs. 12—6—0 in Rajahmundry, Rs. 12—5—0 in Vizagapatam and Trichinopoly Rs 12—4—0 in Cocanada, Rs. 10—5—0 in Coimbatore, Rs. 9—2—0 in Vizianagaram and Rs. 7-13-0 in Bellary When compared with the prices published in the last report, i e, those which prevailed on the 7th September 1942, the above prices reveal a rise of approximately 24 per cent in Cocanada, 16 per cent in Rajahmundry, 12 per cent in Vizagapatam, 11 per cent in Vizianagaram, 10 per cent in Trichinopoly, 6 per cent in Coimbatore, 5 per cent in Bellary and Chittoor, 3 per cent in Mangalore and 2 per cent in Cuddalore, the price remaining stationary in Vellore

Cotton—1942-43—Second forecast report. The average of the areas under cotton in the Madras Province during the five years ending 1940-41 has represented 9·7 per cent of the total area under cotton in India. The area under cotton up to 25th September 1942 is estimated at 856, 900 acres When compared with the area of 823, 500 acres estimated for the corresponding period of last year, it reveals an increase of 4·1 per cent *Central districts and South mainly cambodia tract.* The area in the central districts and the south relates partly to the last year's crop and partly to the current year's sowings which have commenced in parts. *White and red Northerns tract.* The area under White and Red Northerns rose from 63,000 acres to 100,000 acres, i. e, by 58·7 per cent. *Westerns tract.* The area under Westerns fell from 451,000 acres to 438 000 acres i e, by 2 9 per cent. The decrease in area occurs mainly in Anantapur due partly to want of rains at the time of sowing and partly to the "grow more food" campaign. *Warangal and Cocanadas tract.* The area under Warangal and Cocanadas cotton fell from 85,700 acres to 80,800 acres i. e. by 5·7 per cent. The decrease in area occurs mainly in Guntur and Nellore and is due chiefly to want of rains and the time of sowings.

The condition of the crop is generally satisfactory in all the districts except in parts of Bellary and Anantapur where the *mungari* crop suffered from drought to some extent.

The average wholesale price of cotton lint per imperial maund of 82 ⅔ lbs. as reported from important markets on 5th October 1942 was Rs. 22—2—0 for White Northerns, Rs. 16—8—0 for Red Northerns, Rs 16—12—0 for Westerns (*mungari*) Rs. 21—1—0 for Westerns (*jowari*), Rs. 53—5—0 for Tirupur cambodia Rs 44—13—0 for Coimbatore *Karunganni*, Rs. 32—0—0 for Tinnevelly *Karunganni*, Rs. 27-10-0 for Tinnevellies and Rs 35—3—0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 7th September 1942, the prices reveal a rise of approximately 26 per cent in the case of Tirupur cambodia, 25 per cent in the case of Tinnevellies, 21 per cent in the cases of Coimbatore *Karunganni* and *Nadam* cotton and nine per cent in the case of Tinnevelly *Karunganni* and a fall of approximately 14 per cent in the case of Westerns (*mungari* and *jowari*) and seven per cent in the case of White Northerns, the price remaining stationary in the case of Red Northerns. (*Additional Joint Secretary, Board of Revenue, Madras.*)

Cotton raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 6th November 1942 amounted to 650.063 bales of 400 lb lint as against an estimate of 559,700 bales of the total crop of 1941–42 The receipts in the corresponding period of the previous year were 595 774 bales. 585,339 bales mainly of pressed cotton were received at spinning mills and 2.592 bales were exported by sea while 82 422 bales were imported by sea mainly from Karachi and Bombay. (*Director of Agriculture, Madras*).

Estate News and Notes.

Students' tours. The third year B.Sc. students of the College went on week-end trips to the following places :–From the 22nd to the 25th October they visited Palghat At Mundur, near Palghat they observed root crop cultivation and at Kanjikode they visited the estate of Sri Narayanamurthi Ayyar. They were entertained at tea by Sri K. Unnikrishna Menon, Retired Senior Lecturer in Agriculture and Superintendent, Central Farm, Coimbatore. From the 30th October to 1st November they went to Palayakottai to study cattle breeding of the Kangayam animals ; they were the guests of the Pattagar of Palayakottai. From the 13th to 15th November they visited Palni and made enquiries about the agricultural practice in the neighbourhood.

Students' Club. A debate was held on the 20th October on the following subject :–"In the opinion of the house, national unity must precede our independence". Sri D. Sridhara Sastri of the III year was the Speaker and Sri P. N Krishna Ayyar, Lecturer in Entomology, acted as the Observer. The other principal speakers were Sri K. V. S. Suryanarayanamurthi and P. T. Bhaskara Panikkar, for the proposition, and Sri K. R. Narayanaswami and R. Narasimhan against it. After a discussion, the opposition carried the day.

On the 12th November Sri T. A. Ramalingam Chettiar, B A., B. L., M. L. C., delivered an illuminating address on "Co-operation and Agriculture". Janab Mirza Anser Baig, student, III year presided. The learned lecturer traced the growth of the Co-operative movement and observed that there must be intimate contact between the Government and the people for the success of Co-operation.

Games. *Hockey.* Two matches were played, one against the R. S. Puram XI on the 26th October and the second against the Jolley XI on the 1st November. Both the matches ended in a draw.

Another match was played against the Officers' XI on the 3rd November and our Students' XI lost it by 3 to 2 goals.

On the 6th November another interesting match was played against the Stane's High School in the C. R. S. grounds in the Coimbatore Hockey Tournaments and we sustained a defeat by 2 to 1 goals, after a keen fight.

Cricket :- In a match played against the Officers' XI on the 15th November the students were all out for 87 runs (K. M. Thomas 4 for 3, Kothandaraman 4 for 20, Raman 1 for 17), while the Officers scored 132 for 7 (S. N. Venkataraman 34, Shanker Rao 29, Kothandaraman 18 not out)

Inter-class Matches:– Two Hockey matches were played for the Parnell Cup. The first one was between the III year and the 1st year and the second one between 1st year and the IInd year. The III year won in the former and in the latter the I year won.

Madras Agricultural Students' Union. *Editorial Board.* At a meeting of the Editorial Board held on 5th November '42 Sri M. A. Sankara Ayyar was elected as the Sub-Editor.

Association of Economic Biologists. A meeting of the association was held on 26th October when Sri S. V. Parthasarathy presented a paper on "The re-combination problem in breeding work" Sri N L. Dutt, the President of the association presided.

Visitors. Sri P. H. Rama Reddy, the Director of Agriculture, Madras camped on the estate in the first week of the month. Dewan Bahadur Dr A. Lakshmanaswami Mudaliar, Vice-chancellor, Madras University, and Mr. R. C S Bell, Collector of Coimbatore and Chairman of the Board of Honorary Visitors to the College, visited the College and Institute on the 21st and 23rd November respectively.

Rao Bahadur C. Tadulingam Mudaliar, Mayor of Madras.

On behalf of the members of the Madras Agricultural Students' Union we offer to Sri Rao Bahadur C. Tadulingam Mudaliar our hearty congratulations on his election as the Mayor of Madras. He is a member of the Union and was actively connected with it since its inception, particularly as its Secretary for two terms, as Vice-President for six terms and as ex-officio President when he was the Principal of the Agricultural College, Coimbatore, for about five years. Even as an Officer of the Agricultural Department Mr. Tadulingam Mudaliar took a keen interest in many public activities which he continued with greater vigour after his retirement. We are glad to note that his activities were able to impress the city fathers of Madras and induced them to elect him as the first citizen of the city. We wish him every success in his responsible position.

Departmental Notifications.

Gazetted Service.

Posting.

On return from leave A. Gulam Ahmed Sahib Bahadur is posted as D. A. O. Kurnool. Sri K. Raghavacharya, J. I. A and Asst Supdtt. Central Farm, on return from leave, is posted as D A. O Tinnevelly. Sri K. K Raghavan, D A. O. Tinnevelly to be D. A. O. Calicut.

Leave

Sri A. Ramaswami Iyer, D. A. O Kurnool, l. a. p for 3 months and 3 days on half average pay for 2 months and 27 days from 25-10-42. Sri C. M. John, Oil Seeds Specialist, Coimbatore, l. a. p. for 1 month from the date of relief. Sri C. V. Ramaswami Ayyar, Asst Agricultural Chemist, l. a. p. for 1 month from the date of relief. Sri S Sitarama Patrudu, D. A. O, l. a. p for 1 month and 23 days and half average pay for 7 days from 6-10-42.

Subordinate Service.

Transfers.

Name of officer.	From	To
Sri M. P. Narasimha Rao,	Asst. in Cotton, A. R. S. Guntur,	Asst in Cotton, A. R. S. Nandyal.
„ N. G. Narayana,	Asst. in Cotton, A. R. S. Nandyal,	Asst. in Cotton, A. R. S. Hagari.

Sri N. Sobhanadri,	A. D. (on leave)	A. D. Bezwada.
„ P. L. Narasimham,	A. D. Bezwada,	A. D Chodavaram.
„ M. K. Gopalan,	A. D. Trivellore,	A D. Madanapalle.
„ M. Somayya,	A. D. Bhimilipatam,	F. M. A. R. S. Samalkota.
„ K. V. Reddi Naidu,	A. D. Vinukonda,	A. D. Bhimilipatam.
„ K. Govindan Nambiyar,	F. M. Central Farm, Coimbatore,	A. D. Palghat.
„ P. K. Parameswara Menon,	A. D. Palghat,	F. M. A. R. S. Nanjanad.
„ V. Satagopan,	A. D. Mayavaram,	F. M. Central Farm, Coimbatore.
„ R. Krishnamurthi,	A. D. Chengam,	A. D. Mayavaram.

Leave.

Name of officer	Period of leave.
Sri N. C. Thirumalacharya, A. D. Lalgudy,	Extension of l. a. p. for 1 month from 27—10—42.
„ M. Suryanarayana, Asst. in Chemistry,	Extension of l. a. p. for 3 months in continuation from 10—10—42.
„ K. Balaji Rao, A. D. Siruguppa,	Extesion of l. a. p. on m. c. for 2 months from 11—9—42.
„ K. Ramanujachary, A. D. Atmakur,	L. A. P. on m. c. for 1 month from the date of relief
„ M. Somayya, A. D. Bhimilipatam,	L. A. P. for 30 days from 3—11—42.
„ M. Alagiriswamy, A. D. Thiruvannamalai,	L. A. P for 1 month from 10—11—42.
„ N. Krishna Pillai, A. D. Pollachi,	Extension of l. a. P. for 1 month from 10—10—42.
„ K. P. Anantanarayanan, Asst. in Entomology, Coimbatore,	Extension of l. a. p. for 1 month from 11—10—42.
„ C. K. Ramachandran, Asst. in Cotton,	Earned leave for 45 days from 16—11—42.
„ M. Ramamurty, A. D. Peddapur,	Extension of l. a. p. for 1 month and 10 days from 22—11—42.
„ M. K. Gopalan, A. D. Trivellore,	L. a. p on m c. for 4 months from 28—9—42.
„ E. R. Gopala Menon, Asst. in Entomology Coimbatore,	L. a p. for 1 month from 16—11—42.

OBITUARY

M. C. MENON

We regret to learn of the passing away of M. C. Menon, Agricultural Demonstrator, Cannanore, at Trichur, on the 27th October 1942. He was an 'old boy' of the Agricultural College, Coimbatore, and a graduate of the Agricultural College, Poona. He was a keen sportsman and a sociable companion. He was aged only 43 years.